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ENTOMOLOGICAL NEWS

VOL. XLVIII. JUNE, 1937 No. 6

Moulting in Some Lepidoptera.[1]

By BERTHA M. HESS, Philadelphia, Penna.

This subject was brought to my attention by Dr. Calvert who, during his work on dragonflies, (1934, pp. 12-14) found that splits in the exuviae in the different moults were not of the same extent. On endeavoring to compare these results with the manner in which other insects split the cuticle at each moult, there was such a dearth of literature on this subject, that Dr. Calvert suggested to me the raising of various kinds of caterpillars to ascertain whether, at different moults of the same species of caterpillars, and in corresponding moults of different species of caterpillars, the splits in the exuviae are located in the same places and are of the same relative extent, or whether they are located in different places and are of different extents.

The caterpillars used for this study were those of the Tussock Moth (*Hemerocampa leucostigma*), the Fall-web worm (*Hyphantria cunea*), and the Tent Caterpillar (*Malacosoma americana*).

HEMEROCAMPA LEUCOSTIGMA (Liparidae).

The observations recorded in this paper were made from larvae hatched from an egg mass found on an English walnut tree in Philadelphia. Fresh leaves from this tree were fed to the larvae every day from the time they left the egg until they reached the pupal stage. The first nine larvae emerged on May 27, 1933, and the eggs continued to hatch until June 8. The caterpillars were transferred from the egg mass to the leaves with a fine camel's hair brush, to the number of 177. Others may have hatched out and crawled to the leaves themselves, as the latter were always placed so as to touch the twig on which

[1] A thesis in Zoology presented to the Faculty of the Graduate School of the University of Pennsylvania in partial fulfillment of the requirements for the degree of Master of Arts.

the egg mass was tied. Each larva measured 2.227mm in length, width of head being 0.454 mm. On June 3rd, the exuviae from the first moult were found. These had to be sought for with the hand lens.

The method used in studying all the exuviae, was first to examine all, for the manner in which they were split, and then to measure at least ten of each moult.

First exuviae. In almost every case the head capsule was detached from the rest of the exuvia, and in those few cases in which it remained attached it was at one point only, on the ventral surface of the first thoracic segment, and became easily detached at the slightest handling. The head capsule did not rupture at all, although in the exuviae of all the moults, except the last larval moult, the lines which form the Y-suture along which the rupture often takes place in the moulting of other insect larvae, were readily discernible. There was visible, however, the large occipital foramen through which the oesophagus and the nerve cord enter the body. The skin, as it was pushed caudad after it ruptured, became much plaited, or transversely wrinkled, but the foramen retained its circular shape. The skin, subsequently dried, shows the opening of this large cavity at the forward end of the thorax where the head had been joined to it. The exuviae, although covered with long hairs, were transparent enough to enable one to detect the somites. The first exuviae did not show any tussocks. Each exuvia was so light that the slightest breath would blow it away. In order to keep it in place on a slide for examination, it was necessary to float it in a drop of water. The hairs kept the skin a little above the surface of the water and thus prevented it from getting soft and collapsing. The skins always ruptured in the sagittal line on the dorsal surface, if they ruptured at all. Of the eighty-three exuviae of the first moult examined, 3 did not rupture at all, the head capsule only being detached, 75 showed a rupture through the three thoracic segments only, 4 showed a rupture through the three thoracic and the first abdominal segments, and 1 showed a rupture through the three thoracic and the first and second abdominal segments.

Measuring the skins. In order to measure the skins, they were soaked in very hot water for at least fifteen minutes, then put on a slide under the dissecting microscope and gently pulled until all the wrinkles and folds were smoothed out. The exuviae so treated must therefore be longer than the corresponding part of the caterpillars when alive. The skins were then measured under a Bausch and Lomb compound microscope with a 16mm objective from which the lower lens had been removed and a No. 5 eye-piece in which was a micrometer. The measurements were then converted into millimeters. The distances measured were from the center of the third thoracic leg to the center of the first proleg where each joined the body; then from the first to the second proleg, from the second to the third, the third to the fourth, and from the fourth to the last; and the sum was the whole distance from the third thoracic leg to the last proleg. The average length of ten skins thus measured was 2.04 mm. The range was from 1.6798 mm to 2.497 mm, which indicates a great probability of error in the method employed. Caterpillars after the first moult measured 3.859 mm. full length.

Second Exuviae. At the second moult 148 skins showed the following splits, 146 split along the mid-dorsal line and of these, 66 split in the three thoracic segments only, 78 split in the three thoracic and the first abdominal segments, 1 split in the three thoracic and the first and second abdominal segments, 1 split in the three thoracic and the first abdominal segments with a split between the first and second abdominal segments, 1 showed no dorsal split, but the thorax was split from the abdomen, 1 showed no dorsal split, but the first and second thoracic segments were somewhat separated and the third thoracic from the abdominal.

The average length of the second moulted skins from the third thoracic leg to the last proleg was 2.95 mm; the range was from 2.724 to 3.859. After the second moult the two spots on the dorsal part of the abdomen which are red in the last larval instars, now appear, but are orange in color, the head being also this color.

Third exuviae. Several larvae just entering on the third instar measured 5.359 mm including the head. The average length of the exuviae from the third thoracic leg to the last proleg was 6.60 mm. The skins from this moult were much more easily examined than those of the preceding ones, not only because they were much larger, but also because the tufts or tussocks of hair appeared and these definitely marked the first four abdominal segments. At this third moult the splits in the exuviae were as follows: 166 split in the mid-dorsal line and of these 27 split through the three throacic segments only, 124 split through the three thoracic and the first abdominal segments, and 15 split through the three thoracic and the first and second abdominal segments.

Fourth exuviae. At the fourth moult the splits in the exuviae were as follows;—all split along the mid-dorsal line. none of the skins were split through the thorax only. 106 split in the three thoracic and the first abdominal segments, and 9 split in the three thoracic and the first and second abdominal segments. The average length of the fourth exuviae from the third thoracic to the last proleg was 12.132 mm. The range was from 9.761 mm to 12.619 mm.

Fifth exuviae. At the fifth moult the skins split as follows: —all split along the mid-dorsal line, none split through the thorax only, 50 split in the three thoracic and first abdominal segments, and 7 split in the three thoracic and the first and second abdominal segments. The average length of the fifth exuviae was 17.64 mm; the range was from 15.436 mm to 20.430 mm. This was the last moult before the spinning of the cocoons.

Last larval moult. There is a marked difference in the size of the exuviae of the last larval moult, which takes place inside the cocoons. Unlike all the other moults of this caterpillar, the head capsule was attached to the rest of the skin, with no exceptions, and in this moult only does the head show the Y-split. Twenty of these skins were measured and their size and manner of splitting divided them into two definite groups. Using the same measurements as in the other moults,

that is, from the third thoracic leg to the last proleg, 10 of these skins measured from 12.485 mm to 14.528 mm with an average length of 13.45 mm. In these skins the rupture extended from the Y-split in the head, through the thorax in the mid-dorsal line. The other 10 skins measured from 17.479 to 20.203 mm. with an average of 19.26 mm. In these skins the rupture extended from the Y-split in the head, through the thorax and the first abdominal segment, in the mid-dorsal line. Thus the larger exuviae were split through one more segment than the smaller. The larger ones were no doubt females, the smaller ones probably being males. At this last moult 72 skins showed the following splits, 45 Y-split in head, and through the thorax only, 18 Y-split in the head and through the thorax and first abdominal segment, 2 Y-split in head and through the thorax and first and second abdominal segments, 7 with the head crushed, split through the thorax only.

The pupal moult. The pupal skins ruptured in the mid-dorsal line through the two wing-bearing segments, the meso- and meta-thorax, connecting with a transverse split, between the thorax and the abdomen, extending along the dorsal edge of the wings to the lateral line of the pupae. Another split starting on the ventral surface, outlined the ventral edge of the wings, thus separating them from the legs and mouth parts, and continued around to the anterior dorsal surface, separating the pro-thorax from the meso-thorax. These pupal skins were much shorter than the exuviae of the caterpillar, and were very transparent and delicate; the slightest touch causing them to break. They retained the shape after the adult had emerged. These skins were measured dry, with a rule, the female skins being much larger than the male. The following measurements are for the entire length of the pupal exuviae; 6 female measured from 19 to 23 mm. Average 20.33; 12 male measured from 15 to 17 mm. Average 15.085.

Measurements of the heads. The detached heads, 212 in number, including those from every moult, before the spinning of the cocoon, were measured dry, for width. Where the measurements of five or more heads were the same, they are recorded below.

No. Heads Measured	Width in Mm.	Probable Sex	Probable Moult	Growth Ratio
8	0.4541	♂♀	1st	
8	0.6810	♂♀	2nd	1.50 ♂♀
7	0.9988	♂ ♀	3rd	1.47 ♂
9	1.1350	♀ ♂	3rd	1.66 ♀
11	1.4982	♂ ♀	4th	1.50 ♂
37	1.5890	intersex?	4th	
14	1.6798	♀ ♂	4th	1.48 ♀
28	2.270	♂ ♀	5th	1.51 ♂
9	2.3608	intersex?	5th	1.48 intersex?
7	2.4970	♀ ♂	5th	1.49 ♀

L. O. Howard (1899, p. 13) says of the tussock moth larvae, "They cast the skin five times, exhibiting a different character after each moult. The larval stage lasts on an average from one month to five weeks. The larva transforms to pupa within a few hours after completion of the cocoon, and remains in the pupal condition from ten days to two weeks."

(To be continued)

Three Unusual Host Records for Cuterebrine Larvae (Diptera: Oestridae).

By E. F. KNIPLING and W. G. BRUCE, Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The Cuterebrinae, commonly referred to as rodent warbles or bots, have been reported from a wide range of host animals, principally rodents. Records of the occurrence of these larval parasites in other kinds of animals such as cats and dogs are, however, not uncommon. Hall [1] records *Cuterebra* spp. from cats and cites cases involving Cuterebrinae in other hosts.

In recent years a number of larval specimens of this group of Diptera collected from cats and dogs have been referred to the Bureau of Entomology and Plant Quarantine for determination. Unfortunately, so little is known concerning the larval characteristics of the various species that specific determinations are possible only in rare instances.

[1] Hall. M. C. 1921. Cuterebra larvae from cats, with a list of those recorded from other hosts. Jour. Amer. Vet. Med. Assn. 59: 480-484.

In this paper the writers report three cases of the occurrence of *Cuterebra* spp. in what are considered accidental hosts. These records are from a cow, a pig, and a mule. Hall cites a record by Townsend (1917) of a *Bogeria*[2] larva taken from the throat of a pig. A reference is also cited which reports *Cuterebra* from deer in Europe. Apparently the literature on the subject[3] contains no records of the occurrence of Cuterebrinae in cattle and mules.

Information on the cases herein reported is as follows:

Case 1: On September 26, 1935, W. J. Platt extracted one warble from the back of a cow owned by L. C. Eubank of Bushnell, Sumter County, Florida. The specimen proved to be a second-instar larva of *Cuterebra buccata* Fab. The animal was reported as having in its back another warble which was not obtained.

Case 2: On November 21, 1935, a second-instar larva of *Cuterebra* sp. (not *C. buccata*) was removed from the windpipe of a 2- to 3-months'-old-pig from the vicinity of Valdosta, Georgia. The owner of the pig and collector of the larva, G. T. Boyett, stated that the animal had appeared healthy in every respect but that it suddenly began coughing violently and within an hour it had died. The owner made a post-mortem examination of the pig and found that the larva had penetrated the windpipe. The larva, together with the portion of the windpipe in which it was lodged, was examined by one of the writers.

Case 3. An examination of a lot of larvae of *Cochliomyia americana* C. and P. collected from the shoulder of a mule revealed the presence of a second-instar *Cuterebra* larva which proved to be *C. buccata*, the same species as that taken from the cow in case 1. Through correspondence the collector of the larva, H. A. Woodle, county agent, stated that all of the larvae in this lot of specimens, including the *Cuterbera*, were

[2] The writers include the genus *Bogeria* of authors in the genus *Cuterebra*.

[3] J. L. Webb, of the Bureau of Entomology and Plant Quarantine, kindly reviewed the literature on the occurrence of *Cuterebra* in the various hosts.

taken by him from a mule in Edgefield County, South Carolina, on July 16, 1935. The owner of the animal was W. B. Mathis. Aside from the unusual host record in this case, the collection is of interest in that the *Cuterebra* larva probably served as the predisposing cause of the infestation by *Cochliomyia americana.*

A New Species of Cryptophagus, found Associated with Ants. (Coleoptera: Cryptophagidae).

by FRANK E. BLAISDELL, SR., Stanford Medical School and Associate in Research California Academy of Sciences, San Francisco, California.

The species described below was found under bark on an old log and in association with ants. It is evidently new as it cannot be identified among the thirty-two species listed by Thos. L. Casey in his Review of the Cryptophagidae.[1] The species is described as follows:

Cryptophagus blumii n. sp.

Form oval to slightly ovate, a little more than twice as long as wide, in profile moderately convex dorsally. Color more or less dark ferrugineus, luster dull; body surface microscopically granulate, the punctures very minutely submuricate. Pubescence very short and inconspicuous, recumbent, a little longer and more abundant on the under surface of the body, distinctly denser on the abdomen.

Head triangular, almost twice as wide as long before the postocular line; sides convergent, not narrowed by the antennal insertions, margins slightly and broadly arcuate over the antennal fossae, thence feebly sinuate to the epistomal apex, the latter truncate and equal in width to about one-fourth of the width across the eyes; labrum short and broadly arcuate at apex; frons moderately convex, somewhat densely punctate, punctures relatively coarse, well defined and separated by a distance equal to their diameters, slightly denser laterally. Eyes strongly convex and prominent, minutely setigerous; facets somewhat coarse and convex. Antennae stout, in length equal to the pronotal width; segments nine, ten and eleven forming a club that is gradually formed beyond the eighth; funicular segments four to nine inclusive subquadrate and smallest, each very slightly

[1] Jour. N. Y. Ent. Soc., Vol. VIII, No. 2, June, 1900, p. 92.

narrowed to base; second and third equal in length and more robust, especially the former; first large and more or less quadrate; ninth a little wider than the eighth and subquadrate, tenth transverse and a third wider than long, eleventh widest, irregularly oval and slightly oblique at apex.

Pronotum transversely oblong, about one-fourth to almost one-third wider than long; apex transverse in moderate circular arc, angles slightly prominent anteriorly, arcuato-oblique, the obliquity due to the moderate oval truncature which is not polished and slightly unguiculate posteriorly; sides parallel, feebly convergent apically, scarcely sinuate behind the nodes, median denticles minute or obsolete, thence to base scarcely at all arcuate, marginal bead very narrow and not reflexed, marginal fimbriae moderately short and directed backward; base feebly arcuate in middle two-fourths, thence broadly and feebly sinuate to the subrectangular angles, marginal bead distinct but not coarse; disk moderately convex, small impressions are more or less discernable against the basal margin at junction of middle and lateral thirds, internal to which small, raised impunctate callus-like spots may be slightly evident; at sides of the disk the submarginal surface is broadly and very feebly impressed, beginning arcuately from each basal impression and thence forward parallel to the margin toward apex.

Elytral oval, widest at middle, about two-fifths longer than wide and not quite three times as long as the pronotum, base feebly and broadly emarginate, adapted to the prothoracic base, finely beaded; humeri narrowly rounded and exposed; sides broadly and moderately arcuate, converging in apical third to the rounded apex, the latter slightly emarginate at the suture, lateral margin very narrow; disk moderately convex from side to side, arcuately and gradually declivous in apical third; surface finely punctate, punctures shallow and less sharply defined than on the pronotum, each with a very short decumbent hair; parasutural striae very fine and absent in basal fourth or third.

Legs moderate in length, rather slender; metafemora and tibiae subequal in length; tibiae gradually widening from base to apex, the anterior slightly arcuate; metatarsi two-third as long as their tibiae. Abdomen feebly convex, finely and densely punctate.

Males a little less robust, body a little more convergent anteriorly and the abdomen less convex. Female usually a little more robust, less narrowed anteriorly and the abdomen a little more convex.

Measurements. (Types) Length 2.25-2.5 mm.; width 1.0-1.6 mm.

Holotype, male, No. 4193, and *allotype*, female, No. 4194, in author's collection, Museum of the California Academy of Sciences. Collected in Glacier Park, MONTANA, July, 1935, by Mr. John E. Blum, to whom the species is dedicated. Five specimens were secured. One paratype in the Author's collection and two in that of Mr. Blum.

Blumii by Casey's table falls near *fungicola* Zimm. but differs notably in the character of the pubescence, body luster and punctation, as well as in size. In *fungicola* the pubescence is moderate in length and subdecumbent; body oblong, shining and dark testaceous in color; the measurements indicate a smaller species, it occurs in Indiana and Carolina (Zimm.). The body in *blumii* is evidently more strongly convex dorsally.

Most of the species of *Cryptophagus* are attracted to and inhabit musty, mouldy vegetable matter if not too moist; some of the species frequent certain blossoms, as of the chinquapin oak (*Castanopsis sempervirens* Dudley).

Colored Glass Beads for recording data concerning Alcoholic Specimens.

It is obviously desirable to mark all specimens in such a way that it can be told by inspection what data have been recorded concerning them. One may wish to know whether a given specimen has been catalogued, measured, spotted on a distribution map, recorded in print, or figured; it is also important to have types, paratypes and other noteworthy specimens distinctively labelled. A part of such information is ordinarily conveyed by written or printed labels, but the method is so laborious and slow that most workers simply fail to record all the information about their specimens which would prove useful to themselves and others.

The use of minute beads of colored glass offers an easy solution to the problem, so far as alcoholic material is concerned. Different colors of beads are assigned particular meanings; thus a red bead may designate a type, a blue bead a specimen recorded in the literature, etc. Such beads are permanent in color, easily seen in the vial (since they always rest on the bottom and can be "read" from any direction), harmless to delicate specimens because of their small size and globular form, and are relatively inexpensive and easy to obtain in quantity. Their use of course does not do away with the necessity

for labels; name, date, collector, catalogue, and particularly type designations should never be recorded by symbols. But the use of the beads is so easy that it does make possible the recording of additional valuable information without loss of time, simply by dropping the proper bead into the vial with the specimen at the time of recording the data.—H. K. WALLACE and T. H. HUBBELL, Department of Biology, University of Florida.

A Note on Reakirt's Types of Chysophanus mariposa (Lepid.: Lycaenidae).

By JOHN W. CADBURY, 3D, Philadelphia, Pennsylvania.

In connection with another paper in course of preparation on a collection of butterflies from Northern British Columbia, the writer disclosed some information on Reakirt's types of *Polyommatus mariposa*. The following is in large part taken from two letters from Mr. William J. Gerhard of the Field Museum in Chicago.

In the collection of butterflies above referred to is a single specimen of *Chrysophanus mariposa* Reakirt.[1] While making comparisons with the series of *mariposa* contained in the collections of the Academy of Natural Sciences of Philadelphia, I ran across a specimen labeled in handwriting as follows: "mariposa Reak. Type California," and below this a printed label "ex collection Skinner." Desiring further information as to the status of this specimen, I wrote Mr. Gerhard and he replied in a letter dated Chicago, January 20, 1937, as follows:

"I am glad to say that most of Reakirt's types were acquired by Herman Strecker in some unknown manner and are still with, or in the unchanged Strecker Collections in the Field Museum. There are, however, several or more species described by Reakirt, but where the types of them are is not known.

"In his supplement No. 3, to his Lepidoptera-Rhopaloceres and Heteroceres, issued in 1900, Strecker enumerates the types in his collection. Among them are listed seventy-six (76) of Reakirt's types, four of which are enumerated as *Polyommatus mariposa* Reak. Three ♂, one ♀ California. On comparing these specimens rather hastily, I find they agree fairly well, and

[1] In the use of this generic name I follow Holland. See his Butterfly Book, new and thoroughly revised edition—Doubleday, Doran & Co., Inc., publishers, 1931, p. 248.

no doubt are types. In his description, unfortunately, Reakirt does not state the number of specimens he had before him when describing the species, and hence it is difficult to decide whether you have one of the types in the Academy or not.

"As was the custom forty or fifty years ago, an author of a new species did not select one specimen of a series and mark it type, and the remaining specimens paratype. All of the specimens were considered types and later co-types. Therefore the four *mariposa* types of Reakirt are simply marked 'Orig. Types, California, Coll. Reakirt.' There are no more data.

"When Strecker prepared supplement No. 3, he labeled all of the types in his collection with a small red-bordered name label which served as a pin label in all cases. However, he did not indicate his types of the genus *Catocala* in such a manner, probably because he no longer knew which specimens of the series were really the types. But he did write 'Orig. Types or Type' on the name label, and where there was only one specimen there is no doubt. But where there are many specimens, it is not known which one can be regarded as the type".

I therefore wrote to Mr. Gerhard and asked him to designate the best male specimen of *mariposa* as the lectotype, the remaining specimens paratypes. The specimen at the Academy will also become a paratype.

In his second letter, dated Chicago, March 4, 1937, Mr. Gerhard states that the types and paratypes of the Museum's insect collection are not yet catalogued and numbered, and that he has therefore simply pin-labeled the 3 ♂ and 1 ♀ types of *P. mariposa* Reak. as follows:

"A ♂. L(ycaena) Mariposa."

Califa.	Reak.
Orig.	Coll.
Types	Reak.

Also on this specimen he placed a red pen-printed label "Electotype, Cadbury, 1937." The other specimens are labeled as in "a" with the additional labels: "b. ♂," "c ♂," and "d ♀," respectively. Mr. Gerhard states that the ♀ is the best specimen of the four, and that "a ♂" is the best of the males. At the head of the series is pinned a larger, red-bordered label bearing exactly the same information as the smaller individual pin-labels illustrated above.

I take this opportunity to thank Mr. Gerhard for this information and his trouble on my behalf.

A New Euphoria from Texas (Coleoptera: Scarabaeidae).

By MARK ROBINSON, Philadelphia, Pennsylvania.

Euphoria casselberryi, n. sp.

Shape oblong, shining, except elytra and posterior edges of pronotum and apex of scutellum. Piceous, elytra pale yellowish brown except the suture, margins and a few spots on the first costae. Pronotum with a median stripe expanding on each end and a stripe along the anterior three-quarters of the margin of pale yellowish brown.

Clypeus longer than broad, parallel, anterior angles rounded, apical margin feebly emarginate. Head coarsely and densely punctate, clothed with long yellowish pubescence.

Pronotum broader than long, narrower in front, sides in posterior half parallel, base slightly emarginate. Disk moderately convex, surface densely regularly punctate except a smooth place along basal margin. Pubescence rather long and erect. Scutellum coarsely punctured on each side near the base.

Elytral disk feebly convex, vaguely bicostate and sparsely punctured, each puncture bearing a moderately long yellowish hair. Pygidium feebly convex, rugose and clothed with pale yellow hairs.

Body beneath and legs clothed with long yellowish hairs. Metasternal button round and hairy in front. Abdomen rather coarsely punctured.

Anterior tibiae tridentate. Antennal club about as long as the stem.

Length, 14.0 mm.; breadth, 7.0 mm.

Type: ♂, Davis Mountains, TEXAS, June 30, 1930 (G. P. Engelhardt). In author's collection.

Paratypes: 3 ♂, same data, June 30, 1931, and June, (W. T. Davis) (G. P. Engelhardt).

Casselberryi resembles the Mexican species *avita* Janson, but differs, among other things, by having a shining thorax and lacking the two spots on each side of the median line on the pronotum. I take pleasure in naming this species after my good friend Mr. R. C. Casselberry.

Notes on Ceraticelus formosus Banks and C. rugosus Crosby (Araneae: Linyphiidae).

By C. R. Crosby.

In 1892 Banks described *Ceratinella formosa* from a female from Ithaca, New York. In 1905 I described *Ceraticelus rugosus* from two males from Sea Cliff, Long Island, New York. In the females of both species the dorsal abdominal sclerite is confined to the front of the abdomen. In 1925 Crosby and Bishop considered them identical and placed *rugosus* as a synonym of *formosus*. Collections made by Miss Bryant, Mr. Emerton and myself have shown that the favorite habitat of this spider is the ocean beach close to the water's edge. I have often wondered how Mr. Banks happened to find a specimen so far inland as Ithaca, New York.

On October 20, 1936, at Lavergne, Tennessee, I collected two females which had the dorsal abdominal sclerite confined to the front of the abdomen. Later through the kindness of Dr. J. M. Shaver of Peabody College, I had the opportunity of examining a collection of spiders made at the same place by Miss Adelphia Meyers in the course of an ecological investigation some time previously. Here I found three males that obviously belonged with the females I had just caught.

I brought these specimens home with me and compared them with my specimens of *rugosus*. They are not the same. I took them to Cambridge and with the assistance of Mr. Banks and Miss Bryant compared the females with Banks' type of *formosus*. They seem to be identical. The males from Lavergne, Tennessee, which belong with these females are easily distinguished from the males from the New England coast by structural characters.

From this it is evident that *C. formosus* Banks and *C. rugosus* Crosby are distinct species and that the male of the former has at last been found.

Ceraticelus formosus Banks.

Ceratinella formosa Banks, Proc. Acad. Nat. Sci., Phila., 1892, p. 33, pl. 2, f. 55. ♀ only described.

♂. Length, 1.4 mm. Cephalothorax relatively more slender and elongate than in *rugosus*, the head narrower, thorax dull orange yellow and head dark gray, nearly black; in *rugosus* concolorous. Sternum gray over dull orange yellow with the margin blackish, not so smooth and shining as in *rugosus*. Endites and chelicerae much darker. Legs light orange yellow. Palpi darker distally, tarsus nearly black. Abdomen has the dorsal sclerite extending backward about as far as in *rugosus* but much narrower, not occupying the whole width of the abdomen; soft parts dark gray to nearly black.

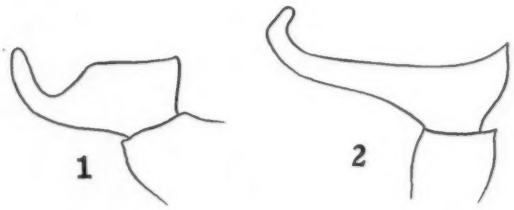


Fig. 1. Lateral view of tibia of male palpus of *Ceraticelus formosus* Fig. 2. Of *C. rugosus.*

The palpus closely resembles that of *rugosus* in all respects except the tibia. The principal difference is in the tibial apophysis; in *formosus* it is shorter and broader; the tip is broadly rounded.

♀. Length, 1.6 mm. Cephalothorax relatively broader than in the male; there is less contrast in color between head and thorax since there is more gray on the former; in one specimen the whole cephalothorax is nearly black. Palpi distinctly darker distally. Dorsal abdominal sclerite confined to anterior part. The epigynum almost the same as in *rugosus*.

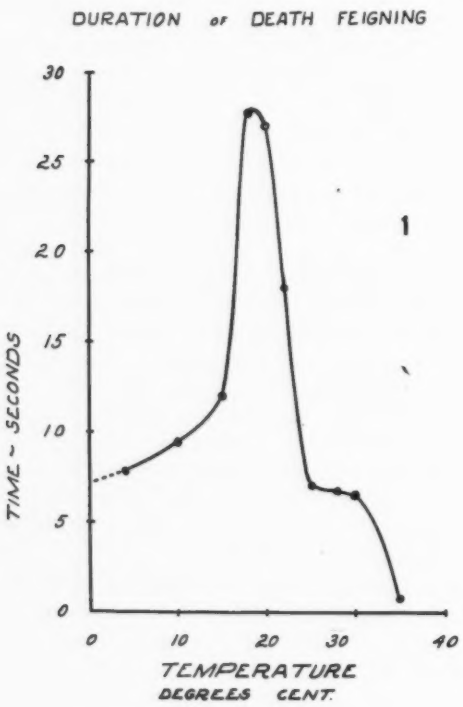
Type localities: *Holotype* female, Ithaca, NEW YORK, *allotype* male, Lavergne, TENNESSEE.

Tennessee: Lavergne, Oct. 20, 1936, 2 ♀ (Crosby); Nov. 1, 2 ♂ (Myers), July 5, 1 ♂ (Myers).

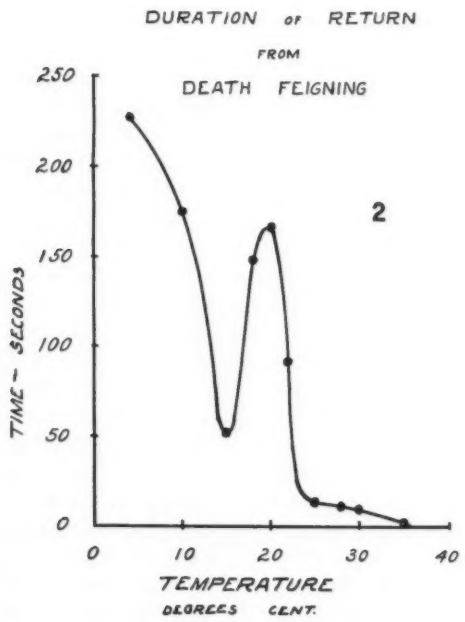
Death Feigning in Sitophilus granarius L., the granary weevil. (Coleoptera: Curculionidae).

By Nellie M. Payne.

In a mixed population of granary weevils there were found to be a certain number which were unable to assume the death feigning position at room temperature. Others were observed to hold the typical position for the species for only a short time. In a population of 1000 beetles of unknown ancestry taken at random from a can of infested wheat, it was found that 7 were unable to assume the position described as death feigning at



Temp.	Duration of Death Feigning Time in Seconds Max.	Min.	Avge.	Duration of Return From Death Feigning Time in Seconds Max.	Min.	Avge.
4°C.	17	1.5	7.8	395	42	227
10	20	2	9.4	326	38	175
15	23	5	12.	94	25	52.2
18	43	20	27.7	215	76	148
20	38	16	27.	236	68	166.5
22	25	9	18	130.1	34.5	91
25	10	4	7	23.9	1	11.9
28	10.2	2.5	6.7	21	2	10.1
30	10	1	6.5	18.4	3	8.4
35	.1	1	.7	0.1	less than .1	less than .1



20°C. and that 116 of those able to assume this position could not do so at 25°C. With rise in temperature the number of beetles unable to feign death increased. With decrease in tem-

perature the number of beetles unable to feign death remained about the same as at 20°C; both the length of time necessary for the righting reaction and the number of trials that were necessary before the beetle had regained a normal position steadily increased. At temperatures of 20°C. and above, the beetles required but one trial to right themselves. At temperatures below 20°C., beetles regularily required more than one trial. Low temperatures increased the righting time more than the duration of the feign. (Table 1 and fig. 1.). The minimum time required for the righting reaction came at 40°C., at which the righting time was less than one-tenth of a second. A second minimum or low value for the righting time was observed at 15°C. (Fig. 2.)

Not only could a quantitative difference, namely the time required for the reflex, but also a qualitative difference could be distinguished between the death feigning reaction at high and low temperatures. At high temperatures the beetles righted themselves quickly and accurately. At low temperatures there was a general clumsiness in the righting reaction. Beetles would move around in circles, some times clockwise, some times counterclockwise. Spiral movements in both directions were observed with the same beetle. At times a beetle would spin about on one of the hind legs before it righted itself. Spiral movements were not observed above 20°C. The effect of temperature on the righting reaction was especially marked with one beetle which was able to assume the death feigning position and to right itself in less than 5 seconds at a temperature of 25°C. At 10°C. this same beetle was unable to right itself at the end of 4 minutes but when warmed under an electric light completed the righting reaction in less than one-tenth of a second.

As observed by Zacher (1930), Bleich (1928) and others, the death feigning position is not identical with the position in death. In *Sitophilus,* dead beetles generally have all the legs extending at right angles from the body. The first pair of legs may be extended beyond the head. The antennae are held straight, generally with the flabellum at right angles to the

scape. In so-called "death feigning" the position assumed does not closely resemble that of true death. The legs are folded upon the thorax and the antennae folded at the proximal segment of the flabellum. A death feigning weevil may lie either on its side or on its back. Dead beetles generally fall over on their sides but may lie on their backs. A lateral view of the dead beetle and of the death feigner present striking differences. In one case the legs are so closely folded that they hardly make any silhouette against a background. In the other the out-stretched legs are a prominent feature of the beetle profile.

If death feigning be interpreted as a protective reaction it must be assumed that the enemies of the beetle in question must be rather poor observers. It must also be assumed that the beetle does not need protection for as long a time at high temperatures as at low.

Temperature was maintained within .5 of a degree of the temperature recorded in the table. Air temperature, not the temperature of the beetle, was rcorded. Beetles were marked with dots of white paint, on the head and corners of the elytra. For example a dot on the head was beetle one, a dot on the head and one on the anterior right part of the elytron was two, a dot on both the anterior corners of the elytra, three, etc. Time was recorded with a stopwatch. This method was accurate enough for the low temperatures but not at high where the actual duration of either righting or the death feigning proper was less than one-tenth second.

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Zacher, F. 1930 Untersuchungen zur Morphologie und Biologie der Samenkäfer (Bruchidae-Lariidae). Beiträge zur Kenntnis der Vorratsschädlinge 6, Beitrag Arb. Biol. Reichsanstalt. f. Land. u. Forstwirtschaft. 18: 233-384.

Asiphonaphis and Aphis Studies (Homoptera: Aphididae).[1]

By GEORGE F. KNOWLTON [2]

The following report deals with three species of *Asiphonaphis*, two of which are here described as new,[3] and several

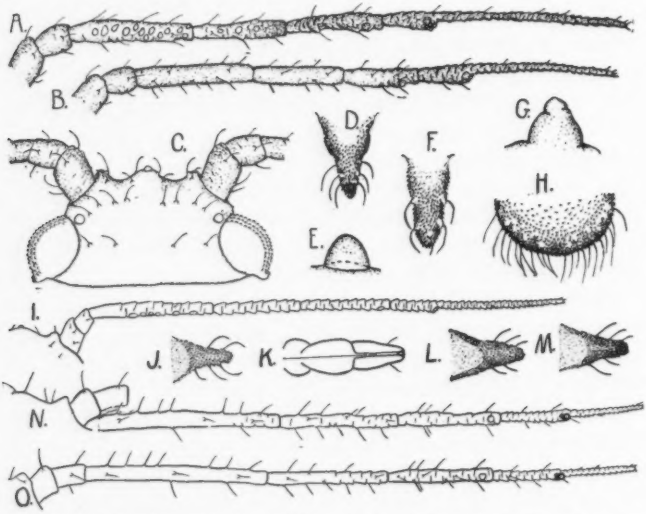

Fig. 1. *Asiphonaphis pruni* W. and D. Alate, A, C-D. Apterous, B, E-H; E, lateral, and G, prothoracic tubercle. *A. utahensis* n. sp. Alate, 1-J. *A. carolinensis* n. sp. Apterous, K-O.

species of *Aphis* whose distribution in the west is incompletely known.

ASIPHONAPHIS PRUNI W. and D. Bountiful, June 1929 (H. J. Pack). Drawings are of specimens from Baraboo, Wisconsin, July 25, 1912 (A. C. Burrill).

Asiphonaphis utahensis n. sp.

Alate vivipara.—Size 1.41 to 1.71 mm. long to base of cauda, and 0.67 to 0.8 mm. wide across the abdomen; head and thorax black; antennae dusky to blackish, 1.03 to 1.24 mm. long; an-

[1] Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

[2] Associate Entomologist.

[3] The writer is indebted to the U. S. National Museum and Dr. P. W. Mason for the opportunity to study the material of the two *Asiphonaphis* species here described.

tennal III, 0.24 to 0.32 mm. long with 5 to 8 sensoria; IV, 0.17 to 0.22; V, 0.17 to 0.2; VI, 0.1 to 0.13 + 0.24 mm.; rostrum reaching second coxae; rostral IV + V 0.114, tip slenderly obtuse; hind tibiae 0.73; hind tarsi 0.11; first and seventh abdominal tubercles largest, remainder present; abdomen with dusky lateral patches which converge on first, sixth and seventh abdominal segments; small to larger, irregular dorsal dusky areas also occur; cauda black, 0.08 mm. long on median line, 0.11 total length.

Taxonomy.—Asiphonaphis utahensis differs from *A. pruni* W. and D. in having fewer than 10 sensoria on antennal III and none on antennal IV; hairs on antennae sparse and inconspicuous.

Collected upon *Salsola pestifer* at Thompsons, UTAH, September 13, 1929 (W. A. Shands). *Type* in the U. S. National Museum.

Asiphonaphis carolinensis n. sp.

Apterous ovipara.—Size 1.71 to 1.74 mm. long and 0.88 to 0.94 wide across the abdomen; antennae dusky, 1.19 to 1.35 mm. long; antennal III, 0.34 to 0.41 mm. long; IV, 0.22 to 0.24; V, 0.21 to 0.23; VI, 0.13 to 0.146 + 0.2 mm.; rostrum reaching third coxae, tip slenderly obtuse; rostral IV + V, 0.1; legs slender and largely blackish; hind tibiae 0.91 to 0.98; hind tarsi 0.14 to 0.16; lateral tubercles conspicuous, rather slender, on abdominal segments 1 to 7; areas along margins of abdomen appear broken up, possibly glandular; cauda black.

Taxonomy.—Asiphonaphis carolinensis has unguis less than twice the length of base, instead of nearly three times base, and more slender lateral tubercles and fewer hairs near tubercles than in *A. pruni* W. and D. The pattern of dorsal and lateral dusky blotches, present in *A. utahensis* K. is lacking in *A. carolinensis.*

Collected on stem of (?) host, Florence, SOUTH CAROLINA, November 22, 1934 (C. F. Rainwater). *Type* in the U. S. National Museum.

APHIS CANAE Will. Buhl, Idaho, October 1930 (D. E. Fox).

A. CARBOCOLOR Gill. Castleford, Idaho, September 12, 1932 (Fox).

A. CHRYSOTHAMNI Wilson. Abundant on young bark of *Chrysothamnus nauseosus* at Brigham, Utah, June 8, 1928;[4] Malad, Idaho, June 1933.

[4] Unless otherwise indicated, collections are by the writer.

A. CHRYSOTHAMNICOLA G. and P. Feeding upon the brown, older twig bark of *Chrysothamnus nauseosus* at Amalga, Utah, September 1, 1926, the specimens being rather sluggish and not easily disturbed. Rostral IV + V is significantly longer than in *A. chrysothamni* Wil. Hollister, Idaho, October 30, 1930 (Fox). Eagele, Colorado, August 24, 1935.

A. ERIOGONI Cowen. Hollister, Idaho, October 1930 (Fox).

A. FRASERAE G. and P. Burley, Idaho, October 1930 (Fox).

A. HERMISTONII Wilson. On *Artemisia tridentata,* Eden, Utah, July 27, 1925.

A. INCOGNITA H. and F. On *Symphoricarpos,* Cowley Canyon, Utah, May 31, 1934 (T. O. Thatcher).

A. LUGENTIS Will. Castleford and Blue Gulch, Idaho, September 12, 1932 (Fox).

A. LUPINI G. and P. On blue *Lupinus,* Florence, Montana, June 17, 1912 (H. F. Dietz).

A. LUTESCENS Monell. Hansen, Idaho, October 1930 (Fox).

A. MINUTISSEMA (G. and P.) On *Artemisia tridentata,* 20 miles west of Castleford, September 30, 1932, and Twin Falls, October 23, 1930, in Idaho (Fox).

A. MONARDE Oest. Twin Falls, Idaho, October 30, 1930 (Fox).

A. NEILLIAE Oest. Murtaugh and Wendell, Idaho, October 1930 (Fox).

A. OENOTHERAE Oest. Hansen, Idaho, October 30, 1930 (Fox).

A. OESTLUNDI Gill. Hansen, Idaho, October 30, 1930 (Fox).

A. OREGONENSIS Wilson. On *Artemisia tridentata* at Brigham, May 17, 1933; Snowville, June 1928 (V. M. Tanner), in Utah.

A. SALICETI Kalt. Buhl and Castleford, Idaho, October 1930 (Fox).

A. SENECIO-RADICIS (G. and P.). Hansen, Idaho, October (Fox).

A. SENSORIATA G. and B. Hollister, Idaho, October (Fox).

A. SOLIDAGINIFOLIAE Will. Berger and Castleford, Idaho, October (Fox).

A. SPIRAECOLA Patch. Twin Falls, Idaho, October 1930 (Fox).

New List of Titles of Publications Referred to by Numbers in Entomological Literature in Entomological News.

1. Transactions of The American Entomological Society. Philadelphia.
2. Entomologische Blätter, red. v. H. Eckstein etc. Berlin.
3. Annales Sci. Naturelles, Zoologie, Paris.
4. Canadian Entomologist. London, Canada.
5. Pysche, A Journal of Entomology. Boston, Mass.
6. Journal of the New York Entomological Society. New York.
7. Annals of the Entomological Society of America. Columbus, Ohio.
8. Entomologists' Monthly Magazine. London.
9. The Entomologist. London.
10. Proceedings of the Ent. Soc. of Washington. Washington, D. C.
11. Deutsche entomologische Zeitschrift. Berlin.
12. Journal of Economic Entomology, Geneva, N. Y.
13. Journal of Entomology and Zoology. Claremont, Cal.
14. Archivos do Instituto Biologico, Sao Paulo.
15. Annales Academia Brasileira de Sciencias. Rio de Janeiro.
17. Entomologische Rundschau. Stuttgart, Germany.
18. Entomologische Zeitschrift. Frankfurt-M.
19. Bulletin of the Brooklyn Entomological Society. Brooklyn, N. Y.
20. Societas entomologica. Stuttgart, Germany.
21. The Entomologists' Record and Journal of Variation. London.
22. Bulletin of Entomological Research. London.
23. Bollettino del Lab. di Zool. gen. e agraria della Portici. Italy.
24. Annales de la société entomologique de France. Paris.
25. Bulletin de la société entomologique de France. Paris.
27. Bolletino della Societa Entomologica Italiana. Genova.
28. Ent. Tidskrift utgifen af Ent. Föreningen i Stockholm. Sweden.
29. Annual Report of the Ent. Society of Ontario. Toronto, Canada.
30. Archivos do Instituto de Biologia Vegetal, R. d. Janeiro.
31. Nature. London.
32. Boletim do Museu Nacional do Rio de Janiero. Brazil.
33. Bull. et Annales de la Société entomologique de Belgique. Bruxelles.
34. Zoologischer Anzeiger, hrsg. v. E. Korschelt. Leipzig.
35. The Annals of Applied Biology. Cambridge, England.
36. Trans. Royal Entomological Society, London. England.
37. Proceedings of the Hawaiian Entomological Society. Honolulu.
38. Bull. of the Southern California Academy of Sciences. Los Angeles.
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40. American Museum Novitates. New York.
41. Mitteilungen der schweiz. ent. Gesellschaft. Schaffhausen, Switzerland.
42. The Journal of Experimental Zoology. Philadelphia.
43. Ohio Journal of Sciences. Columbus, Ohio.
44. Revista chileña de historia natural. Valparaiso, Chile.
45. Zeitschrift für wissenschaftliche Insektenbiologie. Berlin.
46. Zeitschrift für Morphologie und Ökologie der Tiere. Berlin.
47. Journal of Agricultural Research. Washington, D. C.
49. Entomologische Mitteilungen. Berlin.
50. Proceedings of the U. S. National Museum. Washington, D. C.
51. Notulae entomologicae, ed. Soc. ent. Helsingfors. Helsingfors, Finland.
52. Archiv für Naturgeschichte, hrsg. v. E. Strand. Berlin.
53. Quarterly Journal of Microscopical Science. London.
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55. Pan-Pacific Entomologist. San Francisco, Cal.

56. "Konowia". Zeit. für systematische Insektenkunde. Wien, Austria
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61. Proceedings of the California Academy of Sciences. San Francisco.
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78. Bulletin Biologique de la France et de la Belgique. Paris.
79. Koleopterologische Rundschau. Wien.
80. Lepidopterologische Rundschau, hrsg. Adolf Hoffmann. Wien.
82. Bulletin, Division of the Natural History Survey. Urbana, Illinois.
83. Arkiv för zoologie, K. Svenska Vetenskapsakademien i. Stockholm.
84. Ecology. Brooklyn.
85. Genetics. Princeton, New Jersey.
87. Archiv für Entwicklungs mechanik der Organ., hrsg. v. Roux. Leipzig.
88. Die Naturwissenschaften, hrsg. A. Berliner. Berlin.
89. Zoologische Jahrbücher, hrsg. v. Spengel. Jena, Germany.
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91. Journal of the Washington Academy of Sciences. Washington, D. C.
92. Biological Bulletin. Wood's Hole, Massachusetts.
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94. Zeitschrift für wissenschaftliche Zoologie. Leipzig.
95. Proceedings of the Biological Soc. of Washington, Washington, D. C.
97. Biologisches Zentralblatt. Leipzig.
98. Le Naturaliste Canadien. Cap Rouge, Chicoutimi, Quebec.
99. Mélanges exotico-entomologiques, Par Maurice Pic. Moulins, France.
100. Bulletin Intern., Acad. Polonaise Sci. et Lett. Cracovie.
101. Tijdschrift voor entomologie. Nederland. Ent. Ver., Amsterdam.
102. Entomologiske Meddelelser, Entomologisk Forening, Copenhagen.
103. Journal of the Kansas Entomological Society, Lawrence, Kansas.
104. Revista de la Sociedad entomologica Argentina, Buenos Aires.
105. Revista Entomologia, Sao Paulo, Brazil.
106. Anales Sociedad Cientifica Argentina, Buenos Aires.
107. Proc., Royal Entomological Society, London.
108. Revista, Col. Nac. Vicente Rocafuerte, Guayaquil.
109. Arbeiten uber morpholog. und taxonom. ent. aus Berlin-Dahlem.
110. Arbeiten ueber physiolog. u. angewandte ent. aus Berlin-Dahlem.
111. Memorias do Instituto Oswaldo Cruz. Rio de Janeiro.
112. Anales del Instituto de Biologia Mexico.
113. Entomologische Beihefte aus Berlin Dahlem.
114. Occasional Papers of the Museum of Zoology, University of Michigan.
115. Memorias de la Soc. Cubana de Hist. Nat. Havana, Cuba.
116. Parasitology. Ed. Keilin and Hindle. London.

Entomological Literature

COMPILED BY V. S. L. PATE, LAURA S. MACKEY and E. T. CRESSON, Jr.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of ENTOMOLOGICAL NEWS for 10c. The number of, or annual volume, and in some cases the part, heft, &c. the latter within ( ) follows; then the pagination follows the colon :

All continued papers, with few exceptions, are recorded only at their first installments.

(*) Papers containing new forms or names not so stated in titles, have an * within parentheses thus (*) following the pagination of reference to paper.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. Titles of papers containing new forms or new names will be indicated by an asterisk within parentheses at end of reference, (*).

Papers published in the Entomological News are not listed.

GENERAL.—Brues, C. T.—Aberrant feeding behavior among insects and its bearing on the development of specialized food habits. [Quart. Rev. Bio.] 11: 305-319, ill. **Bruner, Lawrence**—Obituary by Barber & Gurney. [10] 39: 59-60, ill. **Bushby, L. C.**—The gamut of sound in the insect world. [Wonders Animal Life] Part. 23: 725-730, ill. **Calman, W. T.**—The origin of insects. [Proc. Linn. Soc.] 1935-36: 193-204, ill. **Das, S. M.**—Insects and disease. [Current Science] V: 503-505. **Dow, Robert Percy.**—Obituary by G. P. Englehardt. [19] 32: 1-4, ill. **Eidmann, H.**—(see under Hymenoptera) **Fracker, S. B.**—Technique of large-scale operations in pest control. [10] 39: 41-59. **Heikertinger, F.**—Werden die Tagfalter von Vogeln gefangt? [97] 57: 1-21. **Horn, W.**—Ueber einen Insekten-Gott der Chinesen. [110] 4:67. **Nikolskaja, M. N.**—The Chalcidoid parasites of some injurious flies of grain crops. [72] 27: 1-27, ill. **Pechuman, L. L.**—An annotated list of the insects found in the bark and wood of Ulmus americana in N. Y. S. [19] 32: 8-21. **Steiniger, F.**—Beobachtungen und Bemerkungen zur Mimikryfrage. [97] 57: 47-58. **Williams, C. B.**—Butterfly travellers. [Nat. Geog. Mag.] 71: 568-584, ill.

ANATOMY, PHYSIOLOGY, ETC.—Balli, A.—Ricerche sul digiuno nella larva Bombyx mori (Lepid.). [Boll.

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To Coccinellidologists.

The Office of the Pan American Union at Washington, D. C., informs us that Mr. Felisberto C. Camargo, Chefe do Departamento da Horticultura, Instituto Agronomico do Estado de S. Paulo, Caixa Postal No. 28, Campinas, Brazil, is desirous of getting in touch with those interested in the Coccinellidae. He has many Coccinellidae of Brazil in his collection, which he would be glad to exchange with individuals in this country who might send him specimens for identification.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

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EXCHANGES

(Continued)

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